

## SEQUENCE LISTING

&lt;110&gt; University of Colorado

<120> Therapeutic and Prophylactic Vaccine for the Treatment and  
Prevention of Papillomavirus Infection

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&lt;210&gt; 1

&lt;211&gt; 455

&lt;212&gt; PRT

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 1

Met Lys Pro Arg Ala Arg Arg Arg Lys Arg Ala Ser Ala Thr Gln Leu

1            5            10            15

Tyr Gln Thr Cys Lys Ala Thr Gly Thr Cys Pro Pro Asp Val Ile Pro

20            25            30

Lys Val Glu His Thr Thr Ile Ala Asp Gln Ile Leu Lys Trp Gly Ser

35            40            45

Leu Gly Val Phe Phe Gly Gly Leu Gly Ile Gly Thr Gly Ala Gly Ser  
50 55 60

Gly Gly Arg Ala Gly Tyr Ile Pro Leu Gly Ser Ser Pro Lys Pro Ala  
65 70 75 80

Ile Thr Gly Gly Pro Ala Ala Arg Pro Pro Val Leu Val Glu Pro Val  
85 90 95

Ala Pro Ser Asp Pro Ser Ile Val Ser Leu Ile Glu Glu Ser Ala Ile  
100 105 110

Ile Asn Ala Gly Ala Pro Glu Val Val Pro Pro Thr Gln Gly Gly Phe  
115 120 125

Thr Ile Thr Ser Ser Glu Ser Thr Thr Pro Ala Ile Leu Asp Val Ser  
130 135 140

Val Thr Asn His Thr Thr Thr Ser Val Phe Gln Asn Pro Leu Phe Thr  
145 150 155 160

Glu Pro Ser Val Ile Gln Pro Gln Pro Pro Val Glu Ala Ser Gly His  
165 170 175

Ile Leu Ile Ser Ala Pro Thr Ile Thr Ser Gln His Val Glu Asp Ile

180 185 190

Pro Leu Asp Thr Phe Val Val Ser Ser Ser Asp Ser Gly Pro Thr Ser

195 200 205

Ser Thr Pro Leu Pro Arg Ala Phe Pro Arg Pro Arg Val Gly Leu Tyr

210 215 220

Ser Arg Ala Leu Gln Gln Val Gln Val Thr Asp Pro Ala Phe Leu Ser

225 230 235 240

Thr Pro Gln Arg Leu Val Thr Tyr Asp Asn Pro Val Tyr Glu Gly Glu

245 250 255

Asp Val Ser Leu Gln Phe Thr His Glu Ser Ile His Asn Ala Pro Asp

260 265 270

Glu Ala Phe Met Asp Ile Ile Arg Leu His Arg Pro Ala Ile Thr Ser

275 280 285

Arg Arg Gly Leu Val Arg Phe Ser Arg Ile Gly Gln Arg Gly Ser Met

290 295 300

Tyr Thr Arg Ser Gly Gln His Ile Gly Ala Arg Ile His Tyr Phe Gln

305 310 315 320

Asp Ile Ser Pro Val Thr Gln Ala Ala Glu Glu Ile Glu Leu His Pro

325 330 335

Leu Val Ala Ala Glu Asn Asp Thr Phe Asp Ile Tyr Ala Glu Pro Phe

340 345 350

Asp Pro Ile Pro Asp Pro Val Gln His Ser Val Thr Gln Ser Tyr Leu

355 360 365

Thr Ser Thr Pro Asn Thr Leu Ser Gln Ser Trp Gly Asn Thr Thr Val

370 375 380

Pro Leu Ser Ile Pro Ser Asp Trp Phe Val Gln Ser Gly Pro Asp Ile

385 390 395 400

Thr Phe Pro Thr Ala Ser Met Gly Thr Pro Phe Ser Pro Val Thr Pro

405 410 415

Ala Leu Pro Thr Gly Pro Val Phe Ile Thr Gly Ser Asp Phe Tyr Leu

420 425 430

His Pro Thr Trp Tyr Phe Ala Arg Arg Arg Arg Lys Arg Ile Pro Leu

435 440 445

Phe Phe Thr Asp Val Ala Ala

450

455

<210> 2

<211> 459

<212> PRT

<213> Human Papillomavirus 6B

<400> 2

Met Ala His Ser Arg Ala Arg Arg Arg Lys Arg Ala Ser Ala Thr Gln

1

5

10

15

Leu Tyr Gln Thr Cys Lys Leu Thr Gly Thr Cys Pro Pro Asp Val Ile

20

25

30

Pro Lys Val Glu His Asn Thr Ile Ala Asp Gln Ile Leu Lys Trp Gly

35

40

45

Ser Leu Gly Val Phe Phe Gly Gly Leu Gly Ile Gly Thr Gly Ser Gly

50

55

60

Thr Gly Gly Arg Thr Gly Tyr Val Pro Leu Gln Thr Ser Ala Lys Pro

65

70

75

80

Ser Ile Thr Ser Gly Pro Met Ala Arg Pro Pro Val Val Val Glu Pro

85 90 95

Val Ala Pro Ser Asp Pro Ser Ile Val Ser Leu Ile Glu Glu Ser Ala

100 105 110

Ile Ile Asn Ala Gly Ala Pro Glu Ile Val Pro Pro Ala His Gly Gly

115 120 125

Phe Thr Ile Thr Ser Ser Glu Thr Thr Thr Pro Ala Ile Leu Asp Val

130 135 140

Ser Val Thr Ser His Thr Thr Thr Ser Ile Phe Arg Asn Pro Val Phe

145 150 155 160

Thr Glu Pro Ser Val Thr Gln Pro Gln Pro Pro Val Glu Ala Asn Gly

165 170 175

His Ile Leu Ile Ser Ala Pro Thr Val Thr Ser His Pro Ile Glu Glu

180 185 190

Ile Pro Leu Asp Thr Phe Val Val Ser Ser Ser Asp Ser Gly Pro Thr

195 200 205

Ser Ser Thr Pro Val Pro Gly Thr Ala Pro Arg Pro Arg Val Gly Leu

210 215 220

Tyr Ser Arg Ala Leu His Gln Val Gln Val Thr Asp Pro Ala Phe Leu  
225                    230                    235                    240

Ser Thr Pro Gln Arg Leu Ile Thr Tyr Asp Asn Pro Val Tyr Glu Gly  
                  245                    250                    255

Glu Asp Val Ser Val Gln Phe Ser His Asp Ser Ile His Asn Ala Pro  
                  260                    265                    270

Asp Glu Ala Phe Met Asp Ile Ile Arg Leu His Arg Pro Ala Ile Ala  
                  275                    280                    285

Ser Arg Arg Gly Leu Val Arg Tyr Ser Arg Ile Gly Gln Arg Gly Ser  
                  290                    295                    300

Met His Thr Arg Ser Gly Lys His Ile Gly Ala Arg Ile His Tyr Phe  
305                    310                    315                    320

Tyr Asp Ile Ser Pro Ile Ala Gln Ala Ala Glu Glu Ile Glu Met His  
                  325                    330                    335

Pro Leu Val Ala Ala Gln Asp Asp Thr Phe Asp Ile Tyr Ala Glu Ser  
                  340                    345                    350

Phe Glu Pro Gly Ile Asn Pro Thr Gln His Pro Val Thr Asn Ile Ser

355 360 365

Asp Thr Tyr Leu Thr Ser Thr Pro Asn Thr Val Thr Gln Pro Trp Gly

370 375 380

Asn Thr Thr Val Pro Leu Ser Leu Pro Asn Asp Pro Phe Leu Gln Ser

385 390 395 400

Gly Pro Asp Ile Thr Phe Pro Thr Ala Pro Met Gly Thr Pro Phe Ser

405 410 415

Pro Val Thr Pro Ala Leu Pro Thr Gly Pro Val Phe Ile Thr Gly Ser

420 425 430

Gly Phe Tyr Leu His Pro Ala Trp Tyr Phe Ala Arg Lys Arg Arg Lys

435 440 445

Arg Ile Pro Leu Phe Phe Ser Asp Val Ala Ala

450 455

<210> 3

<211> 473

<212> PRT

<213> Human Papillomavirus 16



&lt;400&gt; 3

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Gln Leu Tyr Lys Thr Cys Lys Gln Ala Gly Thr Cys Pro Pro Asp Ile

20 25 30

Ile Pro Lys Val Glu Gly Lys Thr Ile Ala Glu Gln Ile Leu Gln Tyr

35 40 45

Gly Ser Met Gly Val Phe Phe Gly Gly Leu Gly Ile Gly Thr Gly Ser

50 55 60

Gly Thr Gly Gly Arg Thr Gly Tyr Ile Pro Leu Gly Thr Arg Pro Pro

65 70 75 80

Thr Ala Thr Asp Thr Leu Ala Pro Val Arg Pro Pro Leu Thr Val Asp

85 90 95

Pro Val Gly Pro Ser Asp Pro Ser Ile Val Ser Leu Val Glu Glu Thr

100 105 110

Ser Phe Ile Asp Ala Gly Ala Pro Thr Ser Val Pro Ser Ile Pro Pro

115 120 125

Asp Val Ser Gly Phe Ser Ile Thr Thr Ser Thr Asp Thr Thr Pro Ala  
130 135 140

Ile Leu Asp Ile Asn Asn Thr Val Thr Thr Val Thr Thr His Asn Asn  
145 150 155 160

Pro Thr Phe Thr Asp Pro Ser Val Leu Gln Pro Pro Thr Pro Ala Glu  
165 170 175

Thr Gly Gly His Phe Thr Leu Ser Ser Ser Thr Ile Ser Thr His Asn  
180 185 190

Tyr Glu Glu Ile Pro Met Asp Thr Phe Ile Val Ser Thr Asn Pro Asn  
195 200 205

Thr Val Thr Ser Ser Thr Pro Ile Pro Gly Ser Arg Pro Val Ala Arg  
210 215 220

Leu Gly Leu Tyr Ser Arg Thr Thr Gln Gln Val Lys Val Val Asp Pro  
225 230 235 240

Ala Phe Val Thr Thr Pro Thr Lys Leu Ile Thr Tyr Asp Asn Pro Ala  
245 250 255

Tyr Glu Gly Ile Asp Val Asp Asn Thr Leu Tyr Phe Ser Ser Asn Asp

260

265

270

Asn Ser Ile Asn Ile Ala Pro Asp Pro Asp Phe Leu Asp Ile Val Ala

275

280

285

Leu His Arg Pro Ala Leu Thr Ser Arg Arg Thr Gly Ile Arg Tyr Ser

290

295

300

Arg Ile Gly Asn Lys Gln Thr Leu Arg Thr Arg Ser Gly Lys Ser Ile

305

310

315

320

Gly Ala Lys Val His Tyr Tyr Tyr Asp Leu Ser Thr Ile Asp Pro Ala

325

330

335

Glu Glu Ile Glu Leu Gln Thr Ile Thr Pro Ser Thr Tyr Thr Thr Thr

340

345

350

Ser His Ala Ala Ser Pro Thr Ser Ile Asn Asn Gly Leu Tyr Asp Ile

355

360

365

Tyr Ala Asp Asp Phe Ile Thr Asp Thr Ser Thr Thr Pro Val Pro Ser

370

375

380

Val Pro Ser Thr Ser Leu Ser Gly Tyr Ile Pro Ala Asn Thr Thr Ile  
385 390 395 400

Pro Phe Gly Gly Ala Tyr Asn Ile Pro Leu Val Ser Gly Pro Asp Ile  
405 410 415

Pro Ile Asn Ile Thr Asp Gln Ala Pro Ser Leu Ile Pro Ile Val Pro  
420 425 430

Gly Ser Pro Gln Tyr Thr Ile Ile Ala Asp Ala Gly Asp Phe Tyr Leu  
435 440 445

His Pro Ser Tyr Tyr Met Leu Arg Lys Arg Arg Lys Arg Leu Pro Tyr  
450 455 460

Phe Phe Ser Asp Val Ser Leu Ala Ala  
465 470

<210> 4

<211> 467

<212> PRT

<213> Human Papillomavirus 33

<400> 4

Met Arg His Lys Arg Ser Thr Arg Arg Lys Arg Ala Ser Ala Thr Gln  
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Leu Tyr Gln Thr Cys Lys Ala Thr Gly Thr Cys Pro Pro Asp Val Ile  
20 25 30

Pro Lys Val Glu Gly Ser Thr Ile Ala Asp Gln Ile Leu Lys Tyr Gly  
35 40 45

Ser Leu Gly Val Phe Phe Gly Gly Leu Gly Ile Gly Thr Gly Ser Gly  
50 55 60

Ser Gly Gly Arg Thr Gly Tyr Val Pro Ile Gly Thr Asp Pro Pro Thr  
65 70 75 80

Ala Ala Ile Pro Leu Gln Pro Ile Arg Pro Pro Val Thr Val Asp Thr  
85 90 95

Val Gly Pro Leu Asp Ser Ser Ile Val Ser Leu Ile Glu Glu Thr Ser  
100 105 110

Phe Ile Glu Ala Gly Ala Pro Ala Pro Ser Ile Pro Thr Pro Ser Gly  
115 120 125

Phe Asp Val Thr Thr Ser Ala Asp Thr Thr Pro Ala Ile Ile Asn Val  
130 135 140

Ser Ser Val Gly Glu Ser Ser Ile Gln Thr Ile Ser Thr His Leu Asn  
145                150                155                160

Pro Thr Phe Thr Glu Pro Ser Val Leu His Pro Pro Ala Pro Ala Glu  
                  165                170                175

Ala Ser Gly His Phe Ile Phe Ser Ser Pro Thr Val Ser Thr Gln Ser  
                  180                185                190

Tyr Glu Asn Ile Pro Met Asp Thr Phe Val Val Ser Thr Asp Ser Ser  
                  195                200                205

Asn Val Thr Ser Ser Thr Pro Ile Pro Gly Ser Arg Pro Val Ala Arg  
                  210                215                220

Leu Gly Leu Tyr Ser Arg Asn Thr Gln Gln Val Lys Val Val Asp Pro  
225                230                235                240

Ala Phe Leu Thr Ser Pro His Lys Leu Ile Thr Tyr Asp Asn Pro Ala  
                  245                250                255

Phe Glu Ser Phe Asp Pro Glu Asp Thr Leu Gln Phe Gln His Ser Asp  
                  260                265                270

Ile Ser Pro Ala Pro Asp Pro Asp Phe Leu Asp Ile Ile Ala Leu His  
275 280 285

Arg Pro Ala Ile Thr Ser Arg Arg His Thr Val Arg Phe Ser Arg Val  
290 295 300

Gly Gln Lys Ala Thr Leu Lys Thr Arg Ser Gly Lys Gln Ile Gly Ala  
305 310 315 320

Arg Ile His Tyr Tyr Gln Asp Leu Ser Pro Ile Val Pro Leu Asp His  
325 330 335

Thr Val Pro Asn Glu Gln Tyr Glu Leu Gln Pro Leu His Asp Thr Ser  
340 345 350

Thr Ser Ser Tyr Ser Ile Asn Asp Gly Leu Tyr Asp Val Tyr Ala Asp  
355 360 365

Asp Val Asp Asn Val His Thr Pro Met Gln His Ser Tyr Ser Thr Phe  
370 375 380

Ala Thr Thr Arg Thr Ser Asn Val Ser Ile Pro Leu Asn Thr Gly Phe  
385 390 395 400

Asp Thr Pro Val Met Ser Gly Pro Asp Ile Pro Ser Pro Leu Phe Pro

405 410 415

Thr Ser Ser Pro Phe Val Pro Ile Ser Pro Phe Phe Pro Phe Asp Thr

420 425 430

Ile Val Val Asp Gly Ala Asp Phe Val Leu His Pro Ser Tyr Phe Ile

435 440 445

Leu Arg Arg Arg Arg Lys Arg Phe Pro Tyr Phe Phe Thr Asp Val Arg

450 455 460

Val Ala Ala

465

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<211> 34

<212> DNA

<213> Human Papillomavirus 11

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34

<210> 6

<211> 38

<212> DNA

<213> Human Papillomavirus



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38

&lt;210&gt; 7

&lt;211&gt; 38

&lt;212&gt; DNA

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 7

gggcctggat ccagatctca caacacacac tgacacac

38

&lt;210&gt; 8

&lt;211&gt; 28

&lt;212&gt; DNA

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 8

ggggcggccg cctaggccgc cacatctg

28

&lt;210&gt; 9

&lt;211&gt; 23

&lt;212&gt; DNA

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 9

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23

&lt;210&gt; 10

&lt;211&gt; 29

<212> DNA

<213> Human Papillomavirus 11

<400> 10

aattccagat ctatacactc cgctatcgc

29

<210> 11

<211> 27

<212> DNA

<213> Human Papillomavirus 11

<400> 11

gggggatcca tgaaacctag ggcacgc

27

<210> 12

<211> 30

<212> DNA

<213> Human Papillomavirus 11

<400> 12

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30

<210> 13

<211> 27

<212> DNA

<213> Human Papillomavirus 11

<400> 13

gggggatcca tgaaacctag ggcacgc

27

<210> 14

<211> 30

<212> DNA

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<210> 15

<211> 27

<212> DNA

<213> Human Papillomavirus 11

<400> 15

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27

<210> 16

<211> 30

<212> DNA

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<400> 16

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30

<210> 17

<211> 27

<212> DNA

<213> Human Papillomavirus 11

&lt;400&gt; 17

gggggatccc ccctgtttac agaaccg

27

&lt;210&gt; 18

&lt;211&gt; 28

&lt;212&gt; DNA

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 18

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28

&lt;210&gt; 19

&lt;211&gt; 27

&lt;212&gt; DNA

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27

&lt;210&gt; 20

&lt;211&gt; 28

&lt;212&gt; DNA

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 20

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28

&lt;210&gt; 21

&lt;211&gt; 27

<212> DNA

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&lt;211&gt; 27

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&lt;213&gt; Human Papillomavirus 11

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25

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&lt;211&gt; 25

&lt;212&gt; DNA

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 41

actcctgctt tagctacagg ccctg

25

&lt;210&gt; 42

&lt;211&gt; 25

&lt;212&gt; DNA

&lt;213&gt; Human Papillomavirus 11

&lt;400&gt; 42

cagggcctgt agctaaagca ggagt

25

&lt;210&gt; 43

&lt;211&gt; 35

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<211> 31

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<210> 47

<211> 34

<212> DNA

<213> Human Papillomavirus 33

<400> 47

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34

<210> 48

<211> 32

<212> DNA

<213> Human Papillomavirus 33

<400> 48

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32

<210> 49

<211> 33

<212> DNA

<213> Human Papillomavirus 1a

<400> 49

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33

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<400> 50

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35

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32

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<211> 30

<212> DNA

<213> Human Papillomavirus 5

<400> 52

aattccgcgg ccgctcacia atatttctt

30

<210> 53

<211> 35

<212> DNA

<213> Human Papillomavirus 12

<400> 53

aattccggat ccggtacaca gggtcatttt tatag

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<213> Human Papillomavirus 12

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aattccgcgg ccgtcacaa atattttctt 30

<210> 55

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<213> Human Papillomavirus 1

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<210> 57

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<212> DNA

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<400> 57

aattccggat ccggaccaca gctacatgtc agg 33

<210> 58

<211> 34

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<213> Human Papillomavirus 1

<400> 58

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34